

NOMENCLATRURAL CHANGES IN THE DIASPIDIDAE  
(HEMIPTERA: COCCOIDEA)

DOUGLASS R. MILLER, MAREN E. GIMPEL, AND DOUGLAS J. WILLIAMS

(DRM) Systematic Entomology Laboratory, PSI, Agricultural Research Service, USDA, Rm. 137, Bldg. 005, BARC-W, Beltsville, MD 20705, U.S.A. (e-mail: dmiller@sel.barc.usda.gov); (MEG) Department of Entomology, University of Maryland, College Park, MD 20742, U.S.A. (e-mail: mgimpel@sel.barc.usda.gov); (DJW) Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, U.K.

---

*Abstract.*—A database containing taxonomic information on two subfamilies of the diaspidid scale insects of the world is available on the World Wide Web. Several nomenclatural changes need to be validated including: *Diaspis amygdali rubra* (Maskell) new illustration and lectotype designation; *Diaspis barberi* Green **new junior synonym** of *D. amygdali rubra* and lectotype designation; *Pseudaulacaspis ernesti* Miller, Gimpel, and Williams a **new replacement name** for *Diaspis grandilobis* Green (junior, secondary homonym of *Diaspis grandilobis* (Maskell)) and new illustration; *Diaspis grandilobis* Green lectotype designation; *Lepidosaphes linearis* (Modeer) discussed as a species *incertae sedis*; *Pseudaulacaspis frutescens* (Hu) **new combination**; *Lepidosaphes meliae* (Tang) **new combination**; *Lepidosaphes lithocarpicola* (Tang) **new combination**, and *Lepidosaphes pseudogloverii* (Borchsenius), **new combination**. The correct spelling of an Asian armored scale should be *Chionaspis kinshinensis* Kuwana, not *C. kiushuensis*. Twenty-six changes of adjectival species epithets are necessary for gender agreement with the genus.

*Key Words:* armored scales, Coccoidea, Diaspididae, ScaleNet, catalog, new combinations, lectotype, internet

---

We recently completed a draft of a database on two subfamilies of the Diaspididae or armored scales (Diaspidinae and Leucaspidae) of the world including about 1,500 valid species. This research is part of a larger project called "ScaleNet" (Ben-Dov et al. 2002) to develop a queryable systematic database of the Coccoidea of the world (see Ben-Dov et al. 1997, Miller et al. 2002, and Miller and Gimpel 1996). A controversial subject in synthesizing systematic data on diaspidids is to clarify the status of genera in the Lepidosaphini. Borchsenius (1966) recognized many gen-

era that we considered to be synonyms of *Lepidosaphes* Shimer, such as *Mytilaspis* Targioni Tozzetti, *Cornuaspis* MacGillivray, *Scobinaspis* MacGillivray, *Insulaspis* Mamet, *Paralepidosaphes* Borchsenius, *Cornimytilus* Borchsenius, *Eucornuaspis* Borchsenius, *Parainsulaspis* Borchsenius, *Pinomytilus* Borchsenius, and *Pistaciaspis* Borchsenius. Other researchers such as Takagi (1970), Danzig (1993), Gill (1997), and Williams and Watson (1988) agreed that there were insufficient criteria for the separation of these genera. Unfortunately, synonymy of these genera causes

several new combinations to be formed and they are given here.

A similar situation occurred with *Phenacaspis* Cooley and Cockerell which is widely considered to be a junior synonym of *Chionaspis* Signoret. In fact, Knipscher et al. (1976) demonstrated that *Phenacaspis nyssae* (Comstock) was the leaf form of *Chionaspis sylvatica* Sanders which occurs on the bark. Liu et al. (1989) provided information on other species with bark and leaf forms that previously were placed in *Chionaspis* and *Phenacaspis*. Others agreeing with the synonymy of *Chionaspis* and *Phenacaspis* include: Takahashi (1953), Takagi (1985), and Danzig and Pellizzari-Scaltriti (1998); those who considered them as distinct include: Borchsenius (1966), Yang, (1982), and Chen (1983). Species once included in *Phenacaspis* are now usually placed in *Chionaspis*, *Pseudaulacaspis* MacGillivray (Takagi 1985), or *Rutherfordia* MacGillivray (Takagi et al. 1989).

#### DEPOSITORIES

Abbreviations given for type depositories are as follows: BMNH—The Natural History Museum, London, U.K.; NZAC—New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand; USNM—United States National Entomological Collection, National Museum of Natural History, Washington, D.C., U.S.A.

#### NEW COMBINATIONS

*Pseudaulacaspis frutescens* (Hu), **n. comb.**  
*Phenacaspis frutescens* Hu 1986: 217

*Lepidosaphes meliae* (Tang), **n. comb.**  
*Paralepidosaphes meliae* Tang 1986: 278

*Lepidosaphes lithocarpicola* (Tang), **n. comb.**  
*Cornimytilus lithocarpicola* Tang 1986: 71

*Lepidosaphes pseudogloverii* (Borchsenius), **n. comb.**  
*Insulaspis pseudogloverii* Borchsenius 1964: 160.

#### SPECIES INCERTAE SEDIS

##### *Lepidosaphes linearis* (Modeer), *incertae sedis*

*Chermes arborum linearis* Geoffroy 1762: 509

*Coccus linearis* Modeer 1778: 22

*Mytilaspis linearis*: Targioni Tozzetti 1868: 737

*Lepidosaphes linearis*: Lindinger 1936: 149

Remarks.—There has been much confusion about both the identity and authorship of *Coccus linearis*. It was originally described by Geoffroy (1762), but his description is invalid because he did not consistently use binominal nomenclature (Commission on Zoological Nomenclature Opinion 228). It was Modeer (1778) who gave the first valid description even though he was validating the work of Geoffroy. The author of the species has been given as several different individuals including: Targioni Tozzetti (Borchsenius 1966); Geoffroy (Signoret 1870); and Geoffroy and Modeer (Douglas 1886). *Lepidosaphes linearis* also has been considered a junior synonym of both *L. conchiformis* (Gmelin) (Gómez Menor Ortega 1937, 1956; Borchsenius 1966) and of *L. ulmi* (Linnaeus) (Lindinger 1911, 1931; Green 1928). Cockerell (1894) thought that it might be a senior synonym of *L. pomorum* Bouché (= *L. ulmi*). To further confuse matters, *Diaspis linearis* Costa is a junior synonym of *L. ulmi*. Because original material is apparently lost and we are unable to determine the true identity of this species, we consider it to be a species *incertae sedis*.

#### HOMONYMY, LECTOTYPE, AND REPLACEMENT NAME

*Pseudaulacaspis ernesti* Miller, Gimpel, and Williams, **new replacement name** (Fig. 1)

*Diaspis grandilobis* Green 1922: 1015

*Pseudaulacaspis grandilobis*: Lindinger 1935: 130

*Chionaspis grandilobis*: Takagi 1970: 52

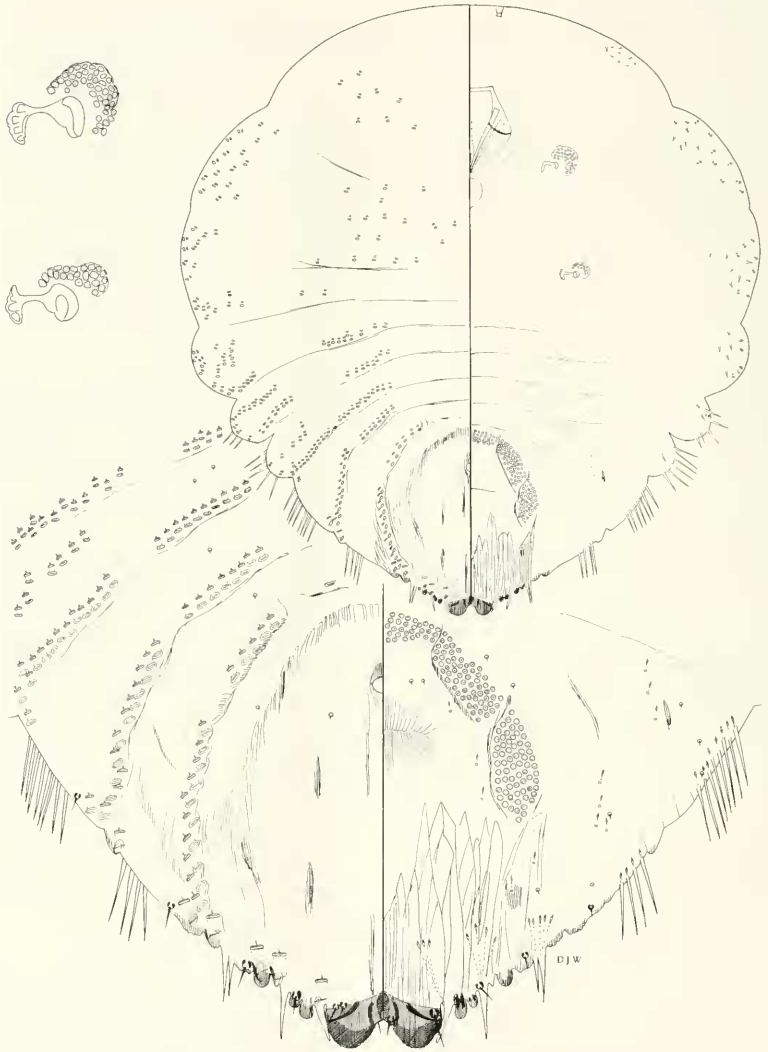


Fig. 1. Adult female *Pseudaulacaspis ernesti*, Peradeniya, Sri Lanka, on *Diospyros thwaitesii*, E. E. Green.

*Pseudaulacaspis grandilobis*: Takagi 1975: 23

Remarks.—We concur with Lindinger's placement of *D. grandilobis* Green in *Pseudaulacaspis* as did Takagi (1975). Therefore, *Pseudaulacaspis grandilobis* Green (1922) became a junior, secondary homonym of *P. grandilobis* (Maskell 1894) when the latter species was moved into *Pseudaulacaspis* by Takagi (1985). Because no replacement name was given, we have selected the epithet "ernesti" in honor of Edward Ernest Green, the author of the species. A lectotype is here designated for *Diaspis grandilobis* Green to stabilize the nomenclatural status of this previously poorly known species. We have examined a single type slide which contains a series of syntypes as follows: a second instar, 4 complete adult females, 1 torn adult-female pygidium, and 1 prepuparium (probably from the same specimen). The slide is labeled as follows: right "Diaspis grandilobis/ *flacourtiæ*/ Green Rutherford/ from Diospyros/ thwaitesii/ Ceylon." left label "TYPE." We have placed a label on the back of the slide that gives a map of the location of the lectotype. The lectotype is the smallest of the adult females and is located in the center of the cover slip. It is deposited in BMNH.

Because the identity of this species is not well known, we have included an illustration of the adult female (Fig. 1). In general appearance it resembles *Rutherfordia major* (Cockerell) by having an oval to turbinate body, large median lobes, and numerous macroducts. It possesses well-developed second and third lobes, however, and in *Rutherfordia*, these characters are rudimentary according to the concept of Takagi et al. (1989). Within *Pseudaulacaspis*, *P. ernesti* Miller, Gimpel, and Williams is most similar to *P. pentagona* (Targioni Tozzetti), *P. prunicola* (Maskell), and *P. mami* (Green). The former two species differ by lacking macroducts on the thorax. *Pseudaulacaspis mami* is more elongate and only

the median and second lobes are well developed.

#### LECTOTYPE DESIGNATION

*Pseudaulacaspis rubra* (Maskell),  
**new status**  
(Figs. 2–3)

*Diaspis amygdali rubra* Maskell 1898: 228  
*Diaspis barberi* Green 1908: 35–36, **new synonymy**  
*Aulacaspis barberi*: Rutherford 1915: 110  
*Pseudaulacaspis barberi*: MacGillivray 1921: 316

Remarks.—Maskell (1898) included two species (from two locations) in the type series of *Diaspis amygdali rubra*. One species was from Japan on *Orixa japonica* Thunb. and was considered to be *Pseudaulacaspis prunicola* by Davidson et al. (1983). They treated *Diaspis amygdali rubra* as a junior subjective synonym of *P. prunicola* but did not designate a lectotype to formalize the action. The second part of the type series was from Sri Lanka (= Ceylon) on *Loranthus* sp. collected by Koebele (Koebele lot no. 1410; Maskell lot no. 565). (There is a note in the Maskell correspondence file at the USNM indicating that Koebele collected the specimens in Kandy, Ceylon). The second series of specimens is the same species as *Diaspis barberi* Green (1908). To clarify the identity of these species and to stabilize their nomenclatural status, we here designate lectotypes of *Diaspis amygdali rubra* and *Diaspis barberi*.

We have selected the lectotype of *D. amygdali rubra* from the series of specimens from Sri Lanka, thus making *Diaspis amygdali rubra* (= *Pseudaulacaspis rubra*) the valid name and *D. barberi* (= *Pseudaulacaspis barberi*) a junior synonym. This action will allow the primary type to be part of the Maskell collection in NZAC, and will include a series of paralectotype specimens in the USNM.

From the syntype series of slides we have selected as lectotype an adult female mounted alone which is labeled as follows:

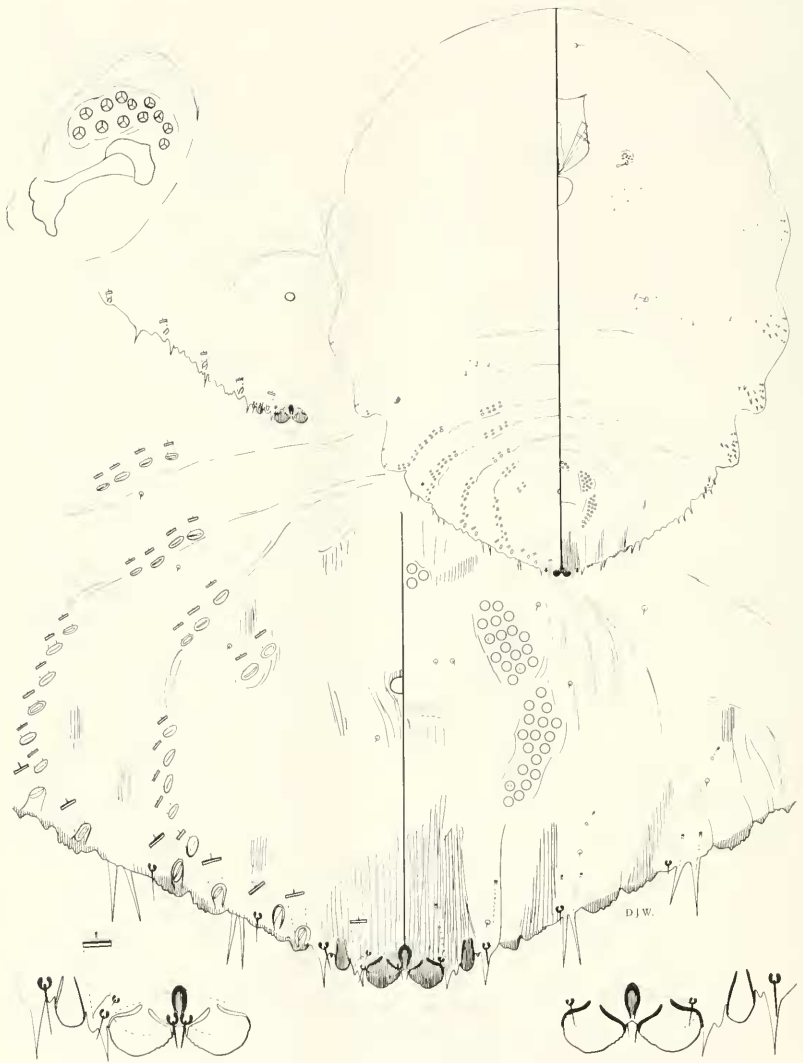


Fig. 2. Adult female *Pseudaulacaspis rubra*, Tanjore, India, on *Loranthus* sp., C. A. Barber. Showing round body form.

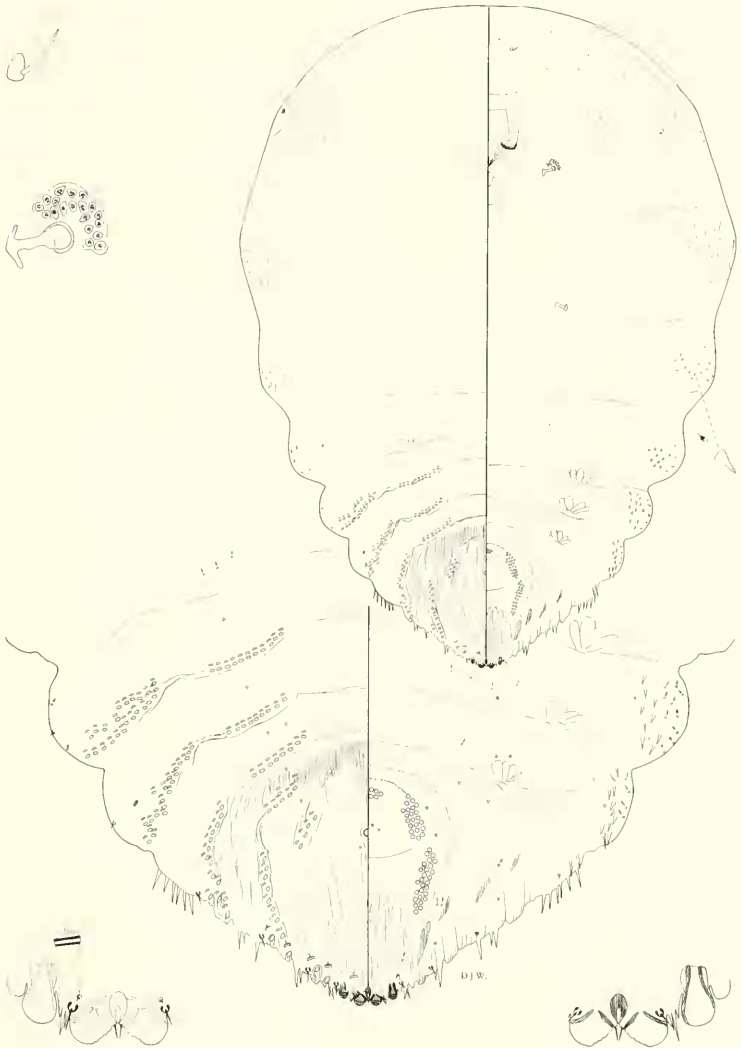


Fig. 3. Adult female *Pseudaulacaspis rubra*, Bangalore, India, on mango stems, VII-1973, Q. K. U. Kumar. Showing more elongate body form.

left "Diaspis/ amygdali/ var/ rubra/ adult female/ 1897 W. M. M./ Entomology Div., DSIR, NZ/ W.M. Maskell Collection." We have placed a label on the right side of the slide indicating that it is the lectotype. This is an original slide that was mounted by Maskell and is deposited in NZAC. In addition, there are 6 other slides in the USNM from the type series as follows: 1 slide with part of a cover; 1 with 2 adult females; 1 with 5 first instars; 1 with 1 first instar, 2 second instars, an immature soft scale, and a very poor prepupa; 1 with 3 adult females; and 1 with 3 adult female scale covers. These were mounted after the original description was published from dry type material and are paralectotypes with the exception of the soft scale.

The type series of *D. barberi* consists of 1 original slide that contains 6 second-instar females and 6 adult females. The slide is labeled as follows: right "Diaspis/ barberi, Green (type)/ From *Loranthus/* Tanjore, India/ Coll. C. A. Barber" left label "TYPE." The lectotype is an adult female and is closest to the bottom of the cover slip. We have placed a label on the back of the slide that gives a map of the location of the lectotype. The lectotype slide is deposited in BMNH. There are 2 additional slides that were mounted from dry type material with the same data as the original slide. They each contain 2 adult females: 1 slide is in BMNH and 1 is in USNM.

Because the identity of this species is not well known, we have included two illustrations of the adult female. Fig. 2 shows a specimen with an oval body from *Loranthus*, and Fig. 3 shows a female with a more elongate body from mango. This species is most similar to *Pseudaulacaspis prunicola* by having: an oval body shape; simple pygidial gland spines; and 3 distinct pairs of lobes. *Pseudaulacaspis rubra* differs by having at least 2 submedial macroducts on each side of segment 6, whereas, these are absent from *P. prunicola*.

#### CHANGED SPECIES EPITHET ENDING

Under normal circumstances, changes in species epithet endings to agree with generic gender would not be worth mentioning in a nomenclatural paper, but in this instance it seemed best to provide a journal reference for these changes rather than a web page such as ScaleNet. Thus, we are including a series of species epithet ending changes.

*Aulacaspis intermedia* for *Aulacaspis intermedius* Chen, Wu, and Su, 1980: 290, 295. *Chionaspis discadenata* for *Chionaspis discadenatus* Danzig, 1976: 3.

*Coccomytilus convexus* for *Mytilaspis convexa* Maskell, 1894: 70.

*Diaspis carmanica* for *Diaspis carmanicus* Davatchi and Balachowsky, 1956: 106–109.

*Diaspis cuneata* for *Diaspis cuneatus* Vernalha, Rocha, Loyola, and Gabardo, 1965: 5–7. *Diaspis digna* for *Diaspis dignus* Hoke, 1928: 671–672.

*Diaspis obliqua* for *Diaspis obliquus* Costa, 1829: 21.

*Diaspis uniglandulosa* for *Diaspis uniglandulosus* Balachowsky and Ferrero, 1967a: 985–988.

*Discodiaspis numidica* for *Rugaspidiotus numidicus* Balachowsky, 1949: 107–108.

*Ferreroaspis hungarica* for *Acanthomytilus hungaricus* Vinis, 1981: 201–207.

*Guiçhoaspis subterranea* for *Guiçhoaspis subterraneus* Young, 1986: 205–206.

*Heimasaspis centrafricana* for *Heimasaspis centrafricanus* Balachowsky and Ferrero, 1967b: 40–42. *Kuwanaspis foliosus* for *Kuwanaspis foliosus* Wu, 1986: 306–307.

*Kuwanaspis multipora* for *Kuwanaspis multiporus* Tang, 1986: 95.

*Lepidosaphes cornuta* for *Lepidosaphes cornutus* Ramakrishna Ayyar, 1937: 147.

*Lepidosaphes lobulata* for *Mytilaspis lobulatus* Froggatt, 1914: 680.

*Mohelnaspis toletana* for *Berlesaspis toletanus* Gómez-Menor Ortega, 1927: 289–292.

- Nimbaspis reticulata* for *Nimbaspis reticulata* Balachowsky, 1952: 129–132.
- Nimbaspis squamosa* for *Nimbaspis squamosus* Balachowsky and Ferrero, 1967c: 1021–1025. *Pinnaspis tuberculata* for *Pinnaspis tuberculatus* Tang, 1986: 297–298.
- Protodiaspis parvula* for *Protodiaspis parvulus* Cockerell, 1898: 428–429.
- Protodiaspis vara* for *Protodiaspis varus* Hoke, 1928: 672–674.
- Pseudaulacaspis sordida* for *Pseudaulacaspis sordidus* Hempel, 1932: 333–334.
- Sclopetaspis lanigera* for *Chionaspis laniger* Newstead, 1920: 206–207.
- Sclopetaspis malawica* for *Sclopetaspis malawicus* Munting, 1970: 12–14.
- Vinculaspis mamillata* for *Vinculaspis mamillatus* Fonseca, 1973: 254–255.

## ACKNOWLEDGMENTS

We are grateful to Jon Martin, Department of Entomology, The Natural History Museum, London, U.K. and Rosa Henderson, Landcare Research, Auckland, New Zealand, for the loan of specimens. We thank the following individuals for their comments and suggestions for improvements in the manuscript: Rosa Henderson (see affiliation above); John Davidson, Department of Entomology, University of Maryland, College Park; Steve Lingafelter, Systematic Entomology Laboratory (SEL), Agricultural Research Service, U. S. Department of Agriculture, Washington, DC; Dave Nickle (SEL), Beltsville, MD.

## LITERATURE CITED

- Balachowsky, A. S. 1949. Sur un *Rugaspidiotus* (Coccoidea-Odonaspidini) nouveau d'Oranie. [Contribution à l'étude des Coccoidea du Nord-Africain, 27e note]. Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord 40: 107–110.
- . 1952. Coccoidea-Diaspidinae nouveaux de Guinée Française (A.O.F.) [Contribution à l'étude des Coccidea des colonies Françaises, 6e note]. Revue de Pathologie Végétale et d'Entomologie Agricole de France 31: 121–132.
- . 1954. Les cochenilles Paléarctiques de la tribu des Diaspidini. Mémoires Scientifiques de l'Institut Pasteur, Paris, 450 pp.
- Balachowsky, A. S. and D. Ferrero. 1967a. Un nouveau *Diaspis* [Coccoidea Diaspidini] vivant sur copalier dans le massif du Bena (République de Guinée). [Contribution à l'étude des Coccoidea de l'Afrique tropicale et équatoriale 8e note]. Annales de la Société Entomologique de France (n.s.) 3: 985–988.
- . 1967b. Un nouveau genre de Diaspidini-Chionaspidina (Coccoidea) de la forêt équatoriale Centrafricaine. [Contribution à l'étude des Coccoidea de l'Afrique tropicale et équatoriale, 9e note]. Cahiers de la Mahoké 5: 37–42.
- . 1967c. Un *Nimbaspis* Balachw. [Coccoidea-Odonaspidini] nouveau de la savane Centrafricaine. [Contribution à l'étude des Coccoidea de l'Afrique tropicale et équatoriale, 10e note]. (In French). Bulletin de l'Institut Fondamental d'Afrique Noire 29: 1021–1025.
- Ben-Dov, Y., C. J. Hodgson, and D. R. Miller. 1997. Changes and comments on the taxonomy and nomenclature of some taxa in the families Coccidae, Eriococcidae and Pseudococcidae (Homoptera: Coccoidea). Phytoparasitica 25: 199–206.
- Ben-Dov, Y., D. R. Miller, and G. A. P. Gibson. 2002. ScaleNet. <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>
- Borchsenius, N. S. 1964. New genera and species of scale insects (Homoptera, Coccoidea, Diaspididae) from Transcaucasia, Middle and Eastern Asia. Entomologicheskoe Obozrenye 34: 152–168. (In Russian. English translation in 1964 Entomological Review 43: 77–82.)
- . 1966. A Catalogue of the Armoured Scale Insects (Diaspidoidea) of the World. Nauka, Moscow and Leningrad, 449 pp. (In Russian.)
- Chen, F. G., Z. Q. Wu, and D. K. Su. 1980. New coccids of the genus *Aulacaspis* in China. Acta Zootaxonomica Sinica 5: 289–296. (In Chinese; summary in English.)
- Chen, F. G. 1983. The Chionaspidini (Diaspididae, Coccoidea, Homoptera) from China. Science and Technology Publishing House, Sichuan Prov., 175 pp.
- Cockerell, T. D. A. 1894. A check list of Nearctic Coccidae. Canadian Entomologist 26: 31–36.
- . 1898. New Coccidae from Mexico. Annals and Magazine of Natural History 1(7): 426–440.
- Costa, O. G. 1829 (1835). Fauna del Regno di Napoli, famiglia de coccinigliferi, o de gallinsetti. Emittenti. Napoli, 23 pp.
- Danzig, E. M. 1976. Two new species of the armored scale insects of the genus *Chionaspis* (Homoptera, Coccoidea, Diaspididae) from the south of the Maritime Province. Trudy Akademii Nauk SSR Zoologicheskogo Instituta. St. Petersburg 62: 3–5. (In Russian.)
- . 1993. Fauna of Russia and Neighbouring Countries. Rhynchota, Vol. X: Suborder Scale In-



- sects (Coccinea): Families Phoenicococcidae and Diaspididae. Nauka Publishing House, St. Petersburg. 452 pp. (In Russian.)
- Danzig, E. M. and G. Pellizzari-Scaltriti. 1998. Diaspididae, pp. 172-370. *In* Kozár, F., ed. Catalogue of Palaearctic Coccoidea. Plant Protection Institute, Hungarian Academy of Sciences, Budapest, Hungary. 526 pp.
- Davatchi, G. A. and A. S. Balachowsky 1956. Contribution à l'étude des insectes des pistachiers. 2. Sur un *Diaspis* Targ. (Coccoidea-Diaspidini) nouveau vivant sur pistacia khinjuk dans le sud-est de l'Iran. *Revue de Pathologie Végétale et d'Entomologie Agricole de France* 35: 105-109.
- Davidson, J. A., D. R. Miller, and S. Nakahara. 1983. The white peach scale, *Pseudaulacaspis pentagona* (Targioni-Tozzetti) (Homoptera: Diaspididae): Evidence that current concepts include two species. *Proceedings of the Entomological Society of Washington* 85: 753-761.
- Douglas, J. W. 1886. Notes on some British Coccidae (No. 2). *Entomologist's Monthly Magazine* 22: 243-250.
- Fonseca, J. P. da. 1973. Contribuição ao conhecimento dos coccídeos do Brasil (Homoptera-Coccoidea). *Arquivos do Instituto Biológico, São Paulo* 40: 247-261. (Summary in English.)
- Froggatt, W. W. 1914. Descriptive catalogue of the scale insects ("Coccidae") of Australia (Part I.) *Agricultural Gazette of New South Wales* 25: 127-136, 311-319, 599-610, 677-684, 875-882, 983-989.
- Geoffroy, E. L. 1762. Histoire abrégée des insectes qui se trouvent aux environs de Paris. Durand, Paris. 523 pp.
- Gill, R. J. 1997. The Scale Insects of California: Part 3. The Armored Scales (Homoptera: Diaspididae). California Department of Food & Agriculture, Sacramento, California, 307 pp.
- Gómez-Menor Ortega, J. 1927. Algunos coccidos nuevos de España (Hem. Cocc.). *EOS* 3: 288-298.
- . 1937. Coccidos de España. Instituto de Investigaciones Agronómicas, Estación, Madrid. 432 pp.
- . 1956. Cochinillas que atacan a los frutales (Homoptera, Coccoidea: I. Familia Diaspididae). *Boletín de Patología Vegetal y Entomología Agrícola. Madrid* 22: 1-105.
- Green, E. E. 1908. Remarks on Indian scale insects (Coccidae), Part III. With a catalogue of all species hitherto recorded from the Indian continent. *Memoirs of the Department of Agriculture in India, Entomology Series* 2: 15-46.
- . 1922. Supplementary notes on the Coccidae of Ceylon. Part IV. *Journal of the Bombay Natural History Society* 28: 1007-1037.
- . 1928. A brief review of the indigenous Coccidae of the British Islands, with emendations and additions (to February, 1928). *Entomologist's Record and Journal of Variation* 40: 1-14.
- Hempel, A. 1932. Descrição de vinte a duas espécies novas de coccídeos (Homoptera-Homoptera). *Revista de Entomologia* 2: 310-339.
- Hoke, G. 1928. Some undescribed diaspines from Mississippi. II. (Homoptera: Coccidae). *Annals of the Entomological Society of America* 21: 671-674.
- Hu, J. 1986. Studies on scale insects in the Hainan Island of China (Part I). Contributions from Shanghai Institute of Entomology 6: 213-227. (In Chinese; summary in English.)
- International Commission on Zoological Nomenclature. 1999. International Code of Zoological Nomenclature Fourth Edition. The International Trust for Zoological Nomenclature, London, 306 pp.
- Knipscher, R. G., D. R. Miller, and J. A. Davidson. 1976. Biosystematics of *Chionaspis nyssae* Comstock (Homoptera: Diaspididae) with evidence supporting leaf and bark dimorphism of the scale. *Melandria* 25: 1-30.
- Kuwana, S. I. 1909. Coccidae of Japan (III). First supplemental list of Japanese Coccidae, or scale insects, with description of eight new species. *Journal of the New York Entomological Society* 17: 150-158.
- . 1928. The diaspine Coccidae of Japan. V. Genera *Chionaspis*, *Tsukushiaspis* [n. gen.], *Leucaspis*, *Nikkoaspis* [n. gen.]. *Scientific Bulletin (Ministry of Agriculture and Forestry, Japan)* 1: 1-39.
- Lindinger, I. 1911. Beiträge zur Kenntnis der Schildläuse und ihre Verbreitung II. *Zeitschrift für wissenschaftliche Insektenbiologie* 7: 9-12, 86-90, 126-130, 172-177.
- . 1914. Die Cocciden-Literatur des Jahres 1909. *Zeitschrift für wissenschaftliche Insektenbiologie* 10: 114-120, 155-160, 243-249.
- . 1931 (1930). Bericht über die Tätigkeit der Abteilung für Pflanzenschutz. A. Die Überwachung der Ein- und Ausfuhr von Obst, Pflanzen und Pflanzenteilen (amtliche pflanzenbeschau). *Jahresbericht, Institut für Angewandte Botanik, Hamburg* 1930: 102-125.
- . 1933. Beiträge zur Kenntnis der Schildläuse (Hemipt.—Homopt., Coccid.). *Entomologischer Anzeiger* 13: 77-166.
- . 1935. Die nunmehr gültigen Namen der Arten in meinem 'Schildläusebuch' und in den 'Schildläusen der Mitteleuropäischen Gewächshäuser'. *Arbeiten über physiologische und angewandte Entomologie* 44: 127-149.
- . 1936. Neue Beiträge zur Kenntnis der Schildläuse (Coccidae). *Entomologisches Jahrbuch* 45: 148-167.
- Liu, T., M. Kosztarab, and M. Rhoades. 1989. I. Biosystematics of the adult females of the genus *Chionaspis* (Homoptera: Coccoidea: Diaspididae)

- of North America, with emphasis on Polymorphism. Studies on the Morphology and Systematics of Scale Insects—No. 15. Virginia Agricultural Experiment Station Bulletin 88-2, 126 pp.
- MacGillivray, A. D. 1921. The Coccidae. Tables for the Identification of the Subfamilies and Some of the More Important Genera and Species, together with Discussions of Their Anatomy and Life History. Scarab, Urbana, Illinois, 502 pp.
- Maskell, W. M. 1894 (1893). Further coccid notes with descriptions of several new species and discussion of various points of interest. Transactions and Proceedings of the New Zealand Institute 26: 65–105.
- . 1898 (1897). Further coccid notes: With descriptions of new species, and discussion of points of interest. Transactions and Proceedings of the New Zealand Institute 30: 219–252.
- Miller, D. R. and M. E. Gimpel. 1996. Nomenclatural changes in the Eriococcidae (Homoptera: Coccoidea). Proceedings of the Entomological Society of Washington 98: 597–606.
- Miller, D. R., Y. Ben-Dov, M. E. Gimpel, V. German, and G. A. P. Gibson. 2002(2001). Recent enhancements in ScaleNet: A queriable systematic database of the scale insects of the world. Bollettino di Zoologia Agraria e di Bachicoltura 33: 19–28.
- Modeer, A. 1778. Om fastflyet. *Coccus*. Handlingar Gotheborgska Vetenskaps och Witterhets Samhällets. Vetenskaps Afdelingen. Gotheborg (ser. 1) 1: 11–50.
- Munting, J. 1970. On some new genera and species of armoured scale insects (Homoptera: Diaspididae) from southern Africa. Novos Taxa Entomológicos [Supplement to Revista de Entomologia Moçambique] 84: 1–14.
- Newstead, R. 1920. Observations on scale-insects (Coccidae)—VI. Bulletin of Entomological Research 10: 175–207.
- Ramakrishna Ayyar, T. V. 1937. Notes on Coccidae (Homoptera, Rhynchota) from south India. Journal of the Bombay Natural History Society 39: 146–148.
- Rutherford, A. 1915. Notes on Ceylon Coccidae. Spolia Zeylanica 10: 103–115.
- Signoret, V. 1870. Essai sur les cochenilles ou gallinsectes (Homoptères-Coccides), 6e partie. Annales de la Société Entomologique de France (serie 4) 10: 91–110.
- Takagi, S. 1970. Diaspididae of Taiwan based on material collected in connection with the Japan-U.S. Cooperative Science Programme, 1965 (Homoptera: Coccoidea). Pt. II. Insecta Matsumurana 33: 146 pp.
- . 1975. Coccoidea collected by the Hokkaido University expedition to Nepal Himalaya, 1968. Insecta Matsumurana (n.s.) 6: 1–33.
- . 1985. The scale insect genus *Chionaspis*: a revised concept (Homoptera: Coccoidea: Diaspididae). Insecta Matsumurana (n.s.) 33: 77.
- Takagi, S. and S. Kawai. 1967. The genera *Chionaspis* and *Pseudaulacaspis* with a criticism on *Phenacaspis* (Homoptera: Coccoidea). Insecta Matsumurana 30: 29–43.
- Takagi, S., T. Y. Pong, and K. S. Ghee. 1989. Beginning with *Dianlucaspis* (Homoptera: Coccoidea: Diaspididae): Convergence or effect? Insecta Matsumurana (n.s.) 42: 143–199.
- Takahashi, R. 1953. Dimorphism in some species of *Chionaspis* or *Phenacaspis*. (Diaspididae, Coccoidea, Homoptera). Bollettino del Laboratorio di Zoologia Generale e Agraria "Filippo Silvestri" 33: 48–56.
- Tang, F. T. 1986. The scale insects of horticulture and forest of China. Vol. III. Shanxi Agricultural University Press, Taiyu, Shanxi, 305 pp. (In Chinese; summary in English.)
- Targioni Tozzetti, A. 1868. Introduzione alla seconda memoria per gli studi sulle cocciniglie, e catalogo dei generi e delle specie della famiglia dei coccidi. Atti della Società italiana di scienze naturali 11: 721–738.
- Vernalha, M. M., M. A. Rocha da Loyola, and J. C. Gabardo. 1965. Uma nova espécie do genero *Diaspis* Costa 1828 (Homoptera-Coccidae). Revista da Escola de Agronomia e Veterinaria 1: 5–7. (Summary in English.)
- Vinis, G. 1981. *Acanthomytilus hungaricus* sp. n. and some new scale insects in the Hungarian fauna (Homoptera: Coccoidea). Folia Entomologica Hungarica (n.s.) 34: 203–207.
- Williams, D. J. and G. W. Watson. 1988. The Scale Insects of the Tropical South Pacific Region. Pt. I: The Armoured Scales (Diaspididae). CAB International Institute of Entomology, London, 290 pp.
- Wu, S. J. 1986. A new species of *Kuwanaspis* (Homoptera: Coccoidea). Acta Entomologica Sinica 29(3): 306–307. (In Chinese; summary in English.)
- Yang, P. L. 1982. General Classification of Scale Insects in China. Shanghai Science & Technology, Shanghai, 425 pp. (In Chinese.)
- Young, B. L. 1986. New genera and species of Diaspididae (Coccoidea) from Yunnan and Guizhou. Contributions of the Shanghai Institute of Entomology 6: 199–211. (In Chinese.)